

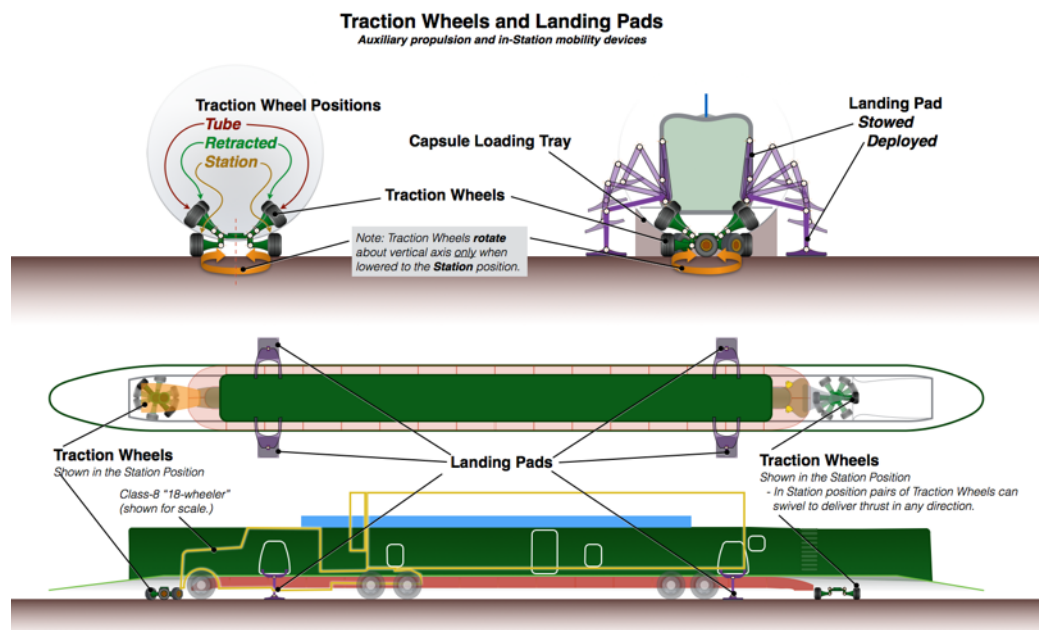
### 3.1.1.10.6

**Supplemental Propulsion and Mobility** Capsules are equipped with Traction Wheels and Landing Pads which allow Capsules to move at low speed, under their own power while in a Tube or in a Station. Figure 3.1.1.10.6-1 illustrates the arrangement and functionality of the Traction Wheels and Landing Pads.

#### 3.1.1.10.6.1

**Traction Wheels** Each Capsule has four (4) Traction Wheels, two at the front and two at the rear. Each Traction Wheel is driven by a separate in-hub motor that can drive in either direction and also serve as a generator to achieve regenerative braking. Each pair of Traction Wheels at the front and back respectively are mounted to an articulated axle as illustrated in Figure 3.1.1.10.6-1. Traction Wheels can be positioned by the axle to which they are attached in any of three positions designated Retracted, Tube and Station. Traction Wheels on a common axle move together and are maintained in the same position. Axles are maintained perpendicular to the long axis of the Capsule at all times except when Traction Wheels mounted to the axle are in the Station position. When the Traction Wheels are in the Station position, the axle is free to rotate about a vertical axis aligned with the Capsule center line as shown.

Traction Wheels do not function at any time to support the weight of the Capsule though Traction Wheels are subject to applied force against the Tube wall or against the Station floor as needed to achieve the required tractive force through the Traction Wheel tires.



**FIGURE 3.1.1.10.6-1**

#### 3.1.1.10.6.1.1

**Retracted Position** Traction Wheels are maintained in the Retracted position under normal operating conditions while the Capsule is

proceeding at speed. While in the retracted position, Traction Wheels do not contact the Tube wall.

- 3.1.1.10.6.1.2 **Tube Position** When in the Tube position, Traction Wheels are pressed against the Tube wall. Three functions are performed by the Traction Wheels while in the Tube position.
- 3.1.1.10.6.1.2.1 **Capsule Positioning in Tube** Traction Wheels provide thrust for positioning the Capsule between the Tube, the Airlock, and the Capsule Loading Tray. Under this operating mode, thrust from the four Traction Wheels in combination shall be sufficient to achieve acceleration / deceleration rates of 2 m/sec<sup>2</sup> over the speed range zero to 5 m/sec, forward or reverse.
- 3.1.1.10.6.1.2.2 **Capsule Propulsion In Tube** Traction Wheels shall propel the capsule at continuous speeds up to 15 m/sec, in the forward or reverse direction while the Capsule is supported by the gas bearings and operating in an nominal 100 Pa or 101 kPa environment. This performance shall be achieved on grades up to and including the steepest design grades on the Hyperloop route. *[This functionality is used for a) proceeding to an Access Facility following a Re-pressurization event or b) when clearing Capsules (in vacuum) from the arrival queue or c) when transferring capsules between Access Facilities and Stations while the Tube is at atmospheric pressure.]*
- 3.1.1.10.6.1.2.3 **Emergency Regenerative Braking** Under emergency braking, Traction Wheels shall provide sufficient regenerative braking thrust to achieve a 2 m/sec<sup>2</sup> deceleration rate for Capsule speeds between 50 m/sec and zero.
- 3.1.1.10.6.2 **Landing Pads** Deployable air bearings (Landing Pads) are provided on each Capsule. Landing Pads in combination with the Traction Wheels operating in the Station position allow Capsules to move in any direction (forward, backward, sideways, skew-wise) and to turn while navigating the Station Apron Floor. Landing Pads are supplied with compressed air from a redundant, dedicated, oil-less compressor system that only operates when the Capsule is in a 1 Atmosphere environment. *[The design as illustrated envisions each Landing Pad as being a 2 x 2 array of air bearings similar to Air Castor, Inc. Model AC-22. Diagonal pairs of these air bearings in each Landing Pad are supplied from one or the other redundant Landing Pad compressors on the Capsule. With one of the two compressor systems failed, the "lift" of the Landing Pads is 60,000 pounds, or 119% of the 50,600 pound Capsule design weight.]*